

4.12 Logarithmic Functions

Name _____ Date _____ Period _____

1. The domain of a logarithmic function $f(x) = \log_a x$ is _____.

2. The graph of every logarithmic function $f(x) = \log_a x$, where $a > 0$, and $a \neq 1$, passes through three points:

_____, _____, and _____.

3. If the graph of a logarithmic function $f(x) = \log_a x$, where $a > 0$, and $a \neq 1$, is increasing, then its base must be larger than _____.

4. **True or False:** If $y = \log_a x$, then $y = a^x$.

5. **True or False:** The graph of $f(x) = \log_a x$, where $a > 0$, and $a \neq 1$, has an x-intercept equal to 1 and no y-intercept.

Change each exponential statement into an equivalent statement involving a logarithm.

6. $9 = 3^2$

7. $a^2 = 1.6$

8. $3^x = 4.6$

9. $e^{2.2} = M$

Change each logarithmic statement to an equivalent statement involving an exponent.

10. $\log_2 8 = 3$

11. $\log_a 3 = 6$

12. $\log_2 6 = x$

13. $\ln x = 4$

Find the exact value of each logarithm without using a calculator.

14. $\log_2 1$

15. $\log_{1/2} 16$

16. $\log_{\sqrt{2}} 4$

17. $\ln \sqrt{e}$

Find the domain of each function.

18. $f(x) = \ln(x-3)$

19. $f(x) = 3 - 2\log_4 \left[\frac{x}{2} - 5 \right]$

20. $g(x) = \log_5 \left(\frac{x+1}{x} \right)$

21. $g(x) = \frac{1}{\ln x}$

Use a calculator to evaluate each expression. Round your answer to three decimal places.

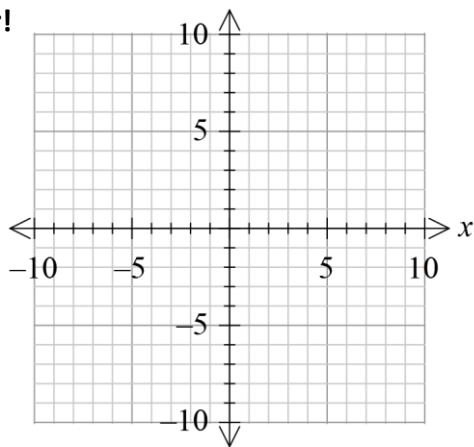
22. $\frac{\ln 5}{3}$

23. $\frac{\ln 4 + \ln 2}{\log 4 + \log 2}$

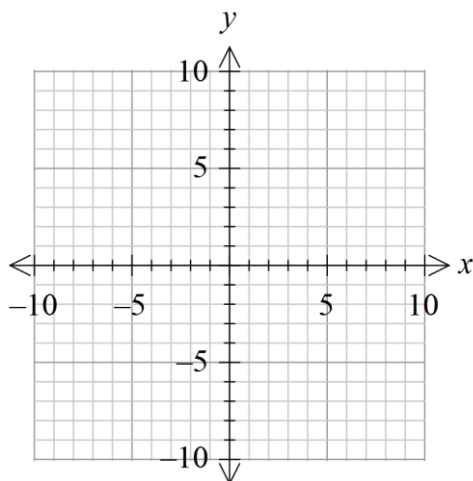
24. $\frac{2\ln 5 + \log 50}{\log 4 - \ln 2}$

Graph each function and its inverse on the same Cartesian plane. Make a table of values for each function to get the graphs. Do not use a graphing calculator!

25. $f(x) = 3^x; f^{-1}(x) = \log_3 x$



26. $f(x) = \frac{1}{2}^x; f^{-1}(x) = \log_{1/2} x$



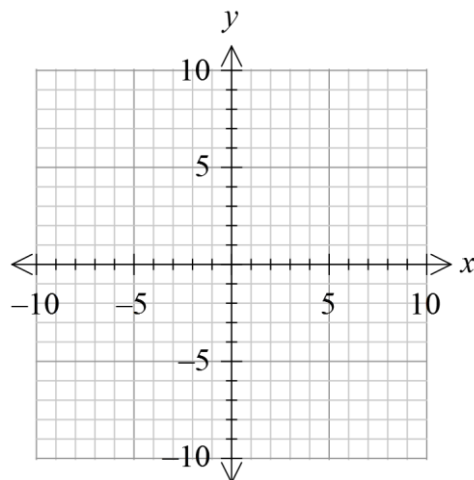
Use the given function f to:

(a) Find the domain of f . (b) Graph f . (c) From the graph determine the range and any asymptotes of f .

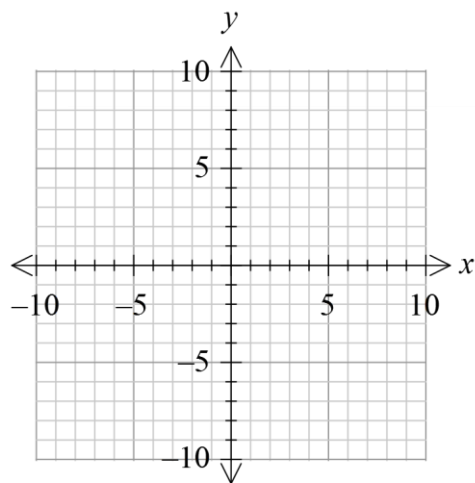
(d) Find f^{-1} , the inverse of f . (e) Find the domain and range of f^{-1} . (f) Graph f^{-1} .

Use transformations and a table of values to get the graphs. Graph on same plane. No graphing calculators!

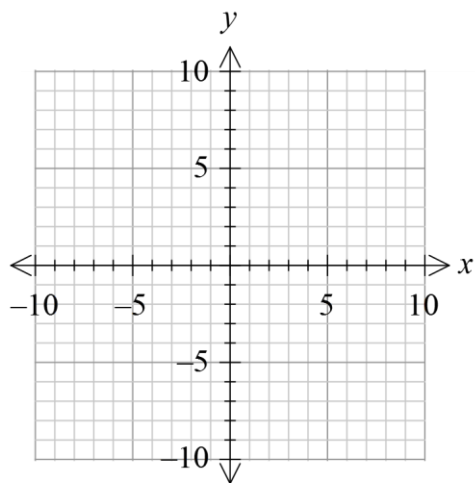
27. $f(x) = \ln(x+4)$



28. $f(x) = -\ln(-x)$



29. $f(x) = \log(x-4) + 2$



Solve each equation. Leave answer as exact solutions. No calculators. Show work!

30. $\log_2(2x+1)=3$

31. $\ln e^x = 5$

32. $\log_4 64 = x$

33. $\log_3 243 = 2x+1$

34. $e^{2x+5} = 8$

35. $\log_2 8^x = -3$

36. $2 \cdot 10^{2-x} = 5$

37. $4 \cdot e^{x+1} = 5$